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CORN FODDER.

Methods of Saving; Cost; Digestibility and Value.

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TEXAS AGRICULTURAL EXPERIMENT STATION.

CORN FODDER.

(GEO. W. CURTIS, M. S. A.)

With the gradual decline in prices, which cotton has suffered for the past two or three years, there has come to many of our farmers a realization of a possible truth in the often preached, but little practiced, maxim that diversity of crops, with more attention to breeding and feeding a better grade of live stock, is the key note to continued prosperity in farming one year with another. We do not mean that our farmers propose to give up raising cotton, or even that we would advise it. We believe that cotton should be, and will be retained as the money crop of the major portion of the state; but let it be remembered that as prices for cotton go down and land becomes relatively higher in value, the question of money in farming becomes a question of narrowing the acreage of cotton; fertilization of the poorer lands now devoted to its culture; more thorough cultivation, and above all, such diversity of crops as will insure the profitable utilization of labor throughout the year, and a steady, even though small, income from the sale of live stock and general farm produce. With this comes the question of what shall be grown for feeding, especially coarse forage or so-called "roughness."

Those who have attempted the growing of cultivated or "tame" grasses for permanent meadow under the unfavorable, long, dry summer conditions with which our farmers are sometimes forced to contend, can appreciate the magnitude of the question as stated. A few have pinned their faith to Johnson Grass, which can unquestionably be made to grow and grow well on good land, but by far the larger number have either passively avoided this perennial plant, or vigorously assailed it as one of the greatest pests which a farmer can introduce on his premises. As we have before stated in previous publications from College and Station, we cannot advise the planting of this grass for any purpose in connection with mixed farming; nor indeed do we at present know of a perennial grass which succeeds well for permanent meadow under our climatic and soil conditions, and is at the same time free from the well grounded objections to Johnson Grass. We are still working on the problem and may possibly yet find something of greater value than at present known.

It is not, however, our purpose in this short bulletin to discuss the comparative values of different crops which may be grown for hay or roughness, but simply to bring forward and make prominent the importance of the corn crop, in this respect, and the manner in which its double value (grain and fodder) may be utilized at lowest cost.

To those who have learned the value of ensilage as a means of preserving green stuff, especially corn (ear, stalk and leaves,) and under

our peculiar conditions of climate, and as a means of circumventing the ravages of the dreaded weevil which makes it extremely difficult to keep dry corn in field or crib for any length of time, it may seem superfluous to discuss the advantages of the different methods of saving fodder; but it must be remembered that while ensilage is of paramount importance in its particular sphere, and furnishes, beyond question, the largest amount of valuable food at lowest cost to the one who understands his business, there is yet and always will be demand and need for corn in the ear or shelled, and for dry roughness of some kind.

No one who understands his business now attempts to use ensilage as an exclusive food, nor would he expect if so used, to draw out anything like its real value for feeding, as when properly combined with other foods; beside this, the man who keeps but a few head of stock would wisely hesitate before putting from $75.00 to $150.00, or $200.00 into an ensilage pit or "silo." While we cannot endorse the extravagant claims made for ensilage by some of its too ardent admirers, we do not hesitate to say it is one of the most valuable means of assisting the Southern farmer in diversifying his farm interests. It not only furnishes a large amount of cheap and valuable food, probably of greatest value in the dairy, but it cannot fail to control to a large extent the ravages of the weevil through the wholesale destruction of both adults and larvæ by heating in the pit.

The great value of ensilage as a means of utilizing the entire corn crop for feeding, is readily admitted by all who understand the subject in its really practical bearings; but the dry methods, by reason of the small money outlay required, and their better adaptation to the uses of small farmers whose stock interests are not large, will always hold an important place in farm economy, especially where perennial grasses are grown under difficulties.

There are three distinct general dry methods of handling the corn crop in as many different parts of the United States. In the Eastern or New England portion, the entire plant, (stalk, ear and leaves) is cut and cured dry in the shock; being hauled into barn when cured, the ears husked out for grain feeding, and the stalks, leaves and shucks used for roughness. In the western or Mississippi valley states, where corn finds its most congenial home, and yields most abundant returns in grain, the ears are commonly husked out or snapped in the field, the stalks with their dried leaves and shucks being left standing, and the cattle turned in to gather whatever they may from the dead herbage. In the South, especially the Southwest, where corn becomes a secondary crop in cotton farming, we find neither the laboriously careful practice of the East, nor the time saving wastefulness of the West, but instead, the practice of saving fodder—a plan wisely midway between these two extremes and of much greater value than either for our Southern conditions.

DIFFERENT METHODS OF SAVING FODDER.

There are three different plans in vogue as follows: "Topping" or cutting the tops above the ears; "pulling" or stripping off the leaves from the entire stalk; and "topping and pulling" or cutting the tops above the ears and pulling the leaves from below. In our tests,

each of these different plans was compared with the others for yield of shelled corn and dry cured fodder, per acre, and with corn which was left standing until ripe and thoroughly dead without mutilation in any way.

Plat No. 1. Tops cut above ears, leaving blades on stalks below.

Plat No. 2. Left without touching until ripe and thoroughly dead.

Plat No. 3. Leaves stripped from entire stalk for fodder, leaving only the stalks and ears standing.

Plat No. 4. Tops cut above the ears, and leaves pulled below, leaving only the naked stalk up to, and including, the ear.

The resulting fodders from above plats were known in each case as follows: From plat number 1 "top fodder;" from plat number 3, "leaf fodder;" from plat number 4, "top and leaf fodder." The analyses were made by number: Number 1 being grain sample from plat 1; number 2, grain sample from plat 2; number 3, grain sample from plat 3; number 4, grain sample from plat 4; number 5, top fodder sample from plat 1; number 7, leaf fodder sample from plat 3; number 8, top and leaf fodder sample from plat 4.

Results for the present year, 1891, may be briefly stated in tabular form as follows:

EFFECT ON QUANTITY OR YIELD OF CORN.

Yield per acre in bushels of shelled corn.

PLAT 1. Tops cut only above ears.	PLAT 2. Left entire.	PLAT 3. Leaves pulled only from entire stalk.	PLAT 4. Tops cut above ears and leaves pulled below.
17.45	17.22	15.9	16.07

Entire field in the experiment was fertilized and handled in exactly the same way, and the yield in each case should have been much greater—the dry weather setting in so early, shortened the crop at least one-third in each case. What difference there is, is seen to be in favor of the plat on which the tops, only, were cut above the ears. This has been our experience each year noticed. May it not be possible that the results thus reached, can be traced to the same causes which Professors Roberts and Wing, of New York, utilized to increase the yield of corn by cutting off the tassels from alternate stalks? In topping for fodder of course the tassel is not cut until it has performed its fertilizing mission, but from our results and the common experience of farmers, questioned in regard to the matter, it would seem that we get more than the "double value" in topping corn for fodder: not only securing a large amount of valuable food at little expense as hereafter stated, but at the same time, increasing slightly the actual yield of corn per acre on the crop so treated.

There is practically no difference whatever in the yield of corn when the leaves are all pulled, and when the tops are cut above ears and leaves pulled below. In other words the lower leaves (those below the ears) seem to be the important portion of the corn plant in growing and maturing the ears after fertilization. Certain it is, that the topping of corn at the proper stage (when ears are well hardened, but stalks, leaves and husks are still green) has no effect whatever to decrease yield, and in many cases the yield of shelled corn per acre will be more or less increased.

EFFECT ON QUALITY OF CORN.

There has been some question as to whether the topping, or pulling of leaves, might have an appreciable effect upon the actual composition of the corn, especially as regards the per-cent. of protein or albuminoids. To determine this, accurate analyses were made by Mr. D. Adriance, M. S., Asst. Chemist, from fair samples of shelled corn grown under respective conditions as noted below:

Composition of shelled corn—per cent.

	PLAT 1. Tops cut, only, above ears.	PLAT 2. Left entire.	PLAT 3. Leaves pulled, only, from entire stalk.	PLAT 4. Tops cut above ears, leaves pulled below.
Protein.....	14.375	14.187	13.218	14.081
Fat.....	4.255	4.767	4.615	5.395
Crude Fibre...	2.145	2.165	2.260	2.387
Carbhydrates..	65.558	65.581	66.336	63.674
Ash.....	1.587	1.525	1.400	2.135
Water	9.750	9.505	10.057	10.075

It will be seen from above table that there is little difference in the protein content of the samples analyzed: as in case of yield, what difference there is seems to be in favor of the plat from which the tops were cut, only, above the ears—showing 14.375 per cent. of protein as against 14.187 per cent. in the corn from plat 2 which was left entire. It is noticed also that the per-cent. of protein is lowest in the corn from plat 3, where the leaves were pulled from the entire stalk. In brief, the slight difference in protein content which is observed follows, almost in direct proportion, the difference in yield of corn as previously explained.

From the standpoint of quantity and quality of corn only, results indicate that it is best to cut tops above ears; 2nd best to let the plant stand without cutting or pulling until dry; 3rd best to cut tops above ears and pull leaves from stalks below; 4th best—or poorest plan of all—to strip leaves from entire stalk.

QUALITY AND VALUATION OF FODDERS.

Our practical experience in feeding different fodders has shown that the leaf fodder has highest value; tops and leaves together, second, and tops only, lowest. The difference in value for feeding is well expressed by the difference in protein content as shown by the following complete analyses made by Mr. Adriance.

Composition of different Fodders—per cent.

	Tops, only, taken from Plat 1.	Leaves, only, taken from Plat 3.	Tops and leaves together taken from Plat 4.
Protein	11.377	14.031	12.103
Fat	2.655	2.665	2.460
Crude Fibre.....	27.580	26.640	26.750
Carbhydrates	41.936	37.254	42.967
Ash.....	8.175	12.240	8.200
Water	8.475	7.170	7.520

From the table it will be seen that on a basis of protein content, if we rate good top fodder at $9.00 per ton—its usual selling price in this locality—we should rate tops and leaves together at about $9.65

per ton, and straight leaf fodder at $11.15 per ton. As a matter of fact actual prices range very near these figures, varying for the different fodders about in the proportion given. The best leaf fodder sells sometimes as high as $12.00 per ton, while top fodder is often sold at $8.00—$10.00 per ton being an average price for tops and leaves together, when well cured and in first class condition generally.

QUANTITY OR YIELD OF FODDERS.

While the difference in actual feeding, and consequently, selling value is considerable as just explained, a by far more important consideration for the practical farmer is the yield or quantity which may be obtained.

Pounds Cured Fodder Per Acre.

From Plat 1, tops only.	From Plat 3, leaves only.	From Plat 4, tops and leaves together.
1093	427	1467

The yield as above given may be accepted as an average, certainly not too high, for corn making 20 to 30 bushels per acre; on richer land yielding more corn, the yield of fodder will be somewhat increased—not, however, in proportion to the increase in the yield of corn. The yield of leaf fodder is scarcely one-half that of tops, and the two combined of course equal, approximately, the yield of tops and leaves together.

DIGESTIBILITY OF FODDERS.

NUTRITIVE RATIO.

(Ratio of Digestible Protein to Digestible Non-Nitrogenous Substances.)

The digestibility of corn fodder, tops and leaves together, corresponding to fodder from plat 4, was determined by Professors Harrington and Adriance last year and reported in detail by Prof. Harrington in bulletin number 15, from this station, May '92. (Which see). The average "digestion coefficients" (per cent. digestible) as there reported, are as follows:

Protein, 55.4 per-cent.; Fat, 71.2 per-cent.; Crude Fibre, 71.4 per-cent.; Carbhydrates, 62.2 per-cent. Accepting these as a fair measure of digestibility for each of the different fodders here discussed, we find the actual amount of digestible nutrients in every hundred pounds of the fodder, and resulting nutritive ratio to be in each case as follows:

	Digestible Protein	Digestible Non-nitrogenous Nutrients.	Nutritive Ratio.
Tops, only	6.3	50.4	1:8
Leaves, only	7.7	47.14	1:6.1
Tops and Leaves together	6.7	50.14	1:7.5

As a basis of comparison with rough food stuffs, or coarse forage, better known in other sections of the United States we extract the following from a table compiled by Director Whitcher of the New Hampshire Experiment Station and published in their bulletin number 8, Nov., 1889:

	Digestible Protein	Digestible Non-nitrogenous Nutrients.	Nutritive Ratio.
Timothy Hay	3.45	48.71	1:14
Red Top Hay	4.74	48.19	1:10
Mixed Hay and Clover	4.85	46.4	1:9.5
Clover Hay	7.53	43.60	1:5.7
Ensilage from Southern Corn	1.32	12.73	1:9.6
Ensilage from Sweet Corn	1.84	14.92	1:8
Pasture (Tame Grasses)	2.5	10.9	1:4.4
Green Rye	2.0	12.87	1:6.4
Sugar Beets	1.5	7.81	1:6.5

From the above it will be seen that pure leaf fodder has a very high value for feeding—second only to clover hay; while tops and leaves together, and tops only, rank somewhat lower in order named, but still higher than the great bulk of Western tame hay.

COST OF SAVING FODDERS.

While the value for feeding of the different fodders, yield per acre which may be obtained, and the effect on yield and quality of corn, are three very important factors in determining the plan to be pursued by the thrifty farmer, there yet remains a still more important factor to be considered—namely: the labor and time, or the actual cost required to gather and store the different fodders.

The following table gives, accurately, the time required to gather and properly store in barn or stack each of the different fodders as previously explained—the whole being computed on a basis of dollars and cents cost per acre of standing corn. The labor is computed at cost of men engaged by the month—$1.00 per day of ten hours for each man; $2.00 per day for man and team. The hours expressed being for one man except when team was used in hauling in for storing when the reference is to one team and wagon and two men:

	Labor used.	Plat 1.—Tops cut only.		Plat 3.—Leaves pulled only.		Plat 4.—Tops cut above ears, leaves pulled below.	
		Time.	Cost.	Time.	Cost.	Time.	Cost.
Top'ng or Pul'ng or both.	One Man.	4.25 h'rs	$0.43	11.1 h'rs	$1.12	10.8 h'rs	$1.09
Tying and Bunching	One Man.	2.4 "	0.24	2.6 "	0.27	3.1 "	0.31
Hauling in and storing in barn or stack	1 team & wagon & 2 men.	1.6 "	0.50	1 "	0.30	2.5 "	0.75
Total cost per acre			$1.17		$1.69		$2.15

[NOTE:—The labor employed in these tests was better than the average, but the men were instructed to work no faster than ordinarily accustomed to do. Possibly 1-10 might be added to cost in each case to allow for labor of a poorer class.]

Comparing still further the yield in pounds per acre of each of the different fodders, and the total cost per acre as per above table, we find the actual cost per ton of dry cured fodder to be in each case as follows:

Tops only,	Cost per ton of dry cured fodder	$2.13.
Leaves only	" " " " " " "	$7.67.
Tops and leaves together	" " " " " " "	$2.25.

So far as the cost of gathering and storing fodder is concerned

there can be no question that saving fodder in any one of the three ways mentioned is a profitable practice. Counting cost in each case, and the value of the different fodders, and especially the effect on yield of corn of the different plans of gathering fodder, the practice of pulling leaves only will be found unprofitable as compared with cutting tops only, or cutting tops above and pulling leaves below the ears. Of the two latter plans we have come to the conclusion that it is more profitable, one year with another, to cut tops only, and unless very short of roughness this will generally be found the better practice. The actual cost per ton of the tops and leaves together is only $2.25, as compared with $2.13, for tops only; and the difference in feeding value as given in a preceding table will make up nicely for the slight difference in cost. Without counting effect on corn, therefore, it would be just as profitable to save lower leaves with tops, as to save tops alone; but so far as our experience goes, and what we have been able to gather from others, it would seem that there is usually more or less loss in yield of corn resulting from the stripping of leaves below the ears, while the yield is rarely reduced and usually increased slightly by the practice of cutting tops only. It is for this reason that we have narrowed down to the practice of cutting tops only, except when short of forage as already noted, in which case we save tops and leaves together.

It should be borne in mind that the above statements are made with the understanding that the tops should be cut, or the leaves pulled, or both, at the proper time. It would be a great mistake to cut or pull too early, as the effect on corn would be disastrous, lessening the yield and making the ears loose and shrunken; while if cut too late, the value of the fodder, only, is impaired. By all means, if a mistake must be made, let it be on the safe side. Do not under any circumstances cut or pull too soon. The rule we adopt is exactly the same as for ensilage, and may be expressed briefly as follows: Let the corn stand until the ears are well hardened—never mind if the lowest leaves are even turning dry and yellow—as late as possible, so that the fodder is saved while the upper leaves, stalk, and the outer husks of the ear are still green. The old idea of cutting corn for ensilage when "in the milk" has given rise to more misunderstanding of the real value of ensilage and the ease with which it may be handled and kept than all other causes combined, and in the same way cutting or pulling fodder too early may result in disappointment and actual loss by decreasing the yield of corn.

In conclusion, we would say to all farmers in this section of the country: do not neglect to save what fodder is made in growing corn, and grow at least enough corn to supply what fodder is really needed for the stock kept on hand.